

What is claimed is:

1. An automated medication preparation system including automated syringe preparation including reconstitution of the medication and delivery of the reconstituted medication to a syringe, the system comprising:

an automated device for delivering a prescribed dosage amount of medication from a drug vial to the syringe by injecting the medication through an uncapped barrel in a just-in-time for use manner, wherein the automated device for delivering a prescribed dosage amount of medication to the syringe comprises an automated device having a fluid delivery device that is movable in at least one direction, wherein the fluid delivery device is adapted to perform at least one of the following operations: (1) receiving and discharging diluent from a diluent supply in a prescribed amount to reconstitute the medication in the drug vial; and (2) aspirating and later discharging reconstituted medication from the drug vial into the syringe; and

a transfer device that includes a first section for piercing the septum of the drug vial and a second section for sealingly yet releasably mating with the fluid delivery device, the transfer device being constructed so that it remains within the drug vial for multiple uses without the need to pierce the septum more than one time, the transfer device having a first channel extending through the first and second sections for carrying diluent or reconstituted medication and a second channel that is in fluid

communication with a vent that is formed as part of the transfer device to permit air to flow into the drug vial.

2. The automated system of claim 2, wherein the fluid delivery device is fluidly connected to a main conduit that is selectively connected at its opposite end to the diluent source and to a means for creating either negative pressure or positive within the main conduit for aspirating fluid into the main conduit or discharging fluid therefrom, respectively.

3. The automated system of claim 2, wherein the means comprises:
a collection member for storing diluent received from either the diluent source or diluent that is drawn into the collection member from a downstream section of the main conduit; and

a control unit and a valve mechanism that are operatively connected to the collection member to create negative pressure therein to draw fluid therein or to create positive pressure to force fluid to be discharged therefrom.

4. The automated system of claim 3, wherein the collection member comprises:

a first syringe having a barrel with an interior having a first volume; and
a second syringe having a barrel with an interior having a second volume;

wherein each of the first and second syringes having a slideable plunger contained in the respective barrel and each syringe being in selective fluid communication with each of the diluent source and the main conduit that leads to the fluid delivery device.

5. The automated system of claim 4, wherein the first volume is at least 50% greater than the second volume.

6. The automated system of claim 4, wherein the control unit comprises:

a first syringe driver associated with the first syringe for selectively moving the plunger a prescribed distance;

a second syringe driver associated with the second syringe for selectively moving the plunger a prescribed distance; and

the valve mechanism includes a first valve for providing selective fluid communication between the control unit and the diluent source and a second valve for providing selective fluid communication between the control unit and the downstream section of the main conduit.

7. The automated system of claim 6, wherein the first and second syringes are fluidly interconnected by a connector conduit that has a valve associated therewith for permitting selective flow between the syringes.

8. The automated system of claim 6, wherein at least one of the first and second syringes has an input port and an output port with the input port being connected to a first conduit that connects at its opposite end to the diluent source with a valve being associated with the first conduit to provide selective communication between the diluent source and the input port, the output port being connected to a second conduit that connects at its opposite end to the main conduit with a valve being associated with the second conduit to provide selective communication between the output port and the main conduit.

9. The automated system of claim 6, wherein each of the first and second syringe drivers comprises a stepper motor that operates such that an incremental distance of movement of the plunger is equated to a number of steps through which the motor is driven, thereby permitting precise control over the exact distance that the plunger is moved.

10. The automated system of claim 1, wherein the first section comprises an end section of the transfer device that terminates in a sharp end for piercing the septum, the first section having both the first and second channels formed therein with each channel being open at the sharp end that is disposed within an interior of the drug vial after the transfer device pierces the septum and is placed in an operating position.

11. The automated system of claim 1, wherein the second section is a connector that includes one of a female luer fitting or a male luer fitting that seals with a complementary fitting formed as part of the fluid delivery device.

12. The automated system of claim 11, wherein the second section includes a female luer slip fitting and the complementary fitting comprises a male luer slip fitting.

13. The automated system of claim 11, wherein the second section includes a female luer lock fitting and the complementary fitting comprises a male luer lock fitting.

14. The automated system of claim 11, wherein the second section includes a male luer slip fitting and the complementary fitting comprises a female luer slip fitting.

15. The automated system of claim 1, wherein the vent includes (1) a hollow vent body that is integrally attached to and extends outwardly from a main body of the transfer device that includes the first section at one end and the second section at the other end, and (2) a removable cap that is slidably received about the vent body, the cap having a filter disposed across a partially open end thereof.

16. The automated system of claim 15, wherein part of the second channel is defined by the vent body, while another part thereof is formed in the main body of the transfer device.

17. The automated system of claim 15, wherein the vent body is formed substantially perpendicular to the main body.

18. The automated system of claim 1, wherein the transfer device has a base section with the first section extending outwardly from a first face thereof and the second section extends outwardly from an opposite second face thereof, the base section having openings formed therethrough that are associated with the first and second channels.

19. An automated medication preparation system including automated syringe preparation including reconstitution of the medication and delivery of the reconstituted medication to a syringe from a drug vial, the system comprising:

an automated device for delivering a prescribed dosage amount of medication to the syringe by injecting the medication through an uncapped barrel in a just-in-time for use manner, wherein the automated device for delivering a prescribed dosage amount of medication to the syringe comprises an automated device having a fluid delivery device that is movable in at least one direction, wherein the fluid delivery

device includes a fluid conduit having a first luer fitting formed at a distal end thereof;
and

a transfer device that includes a first section for piercing the septum of the drug vial and a second section that includes a second luer fitting that complementarily mates with the first fitting to produce a sealed luer fitting, the transfer device intended to remain within the drug vial for multiple fluid transfers without the need to pierce the septum more than one time, the transfer device having a fluid portal through which fluid can flow from the fluid delivery device to the drug vial and a vent channel that is in fluid communication with a vent that is formed as part of the transfer device to permit air to flow into the drug vial.

20. The automated system of claim 19, wherein the first luer fitting is a male luer fitting and the second luer fitting is a female luer fitting.

21. The automated system of claim 19, wherein the first luer fitting is a male slip luer fitting and the second luer fitting is a female luer slip fitting.

22. The automated system of claim 19, wherein the second section includes a female luer lock fitting and the complementary fitting comprises a male luer lock fitting.

23. The automated system of claim 19, wherein the vent includes (1) a hollow vent body that is integrally attached to and extends outwardly from a main body of the transfer device that includes the first section at one end and the second section at the other end, and (2) a removable cap that is slidably received about the vent body, the cap having a filter disposed across a partially open end thereof.

24. An automated medication preparation system including automated syringe preparation including reconstitution of the medication and delivery of the reconstituted medication to a syringe from a drug vial, the system comprising:

an automated device for delivering a prescribed dosage amount of medication to the syringe by injecting the medication through an uncapped barrel in a just-in-time for use manner, wherein the automated device for delivering a prescribed dosage amount of medication to the syringe comprises an automated device having a fluid delivery device that is movable in at least one direction and includes a main fluid conduit; and

a vented dispensing pin that includes a first section for piercing the septum of the drug vial and a second section that along with a coupling feature of the fluid transfer device forms a male-female interference fitting that creates a continuous fluid pathway by joining the fluid delivery device and the transfer device includes a second luer fitting that complementarily mates with the first luer fitting to produce a sealed luer fitting, the transfer device intended to remain within the drug vial for multiple fluid transfers without the need to pierce the septum more than one time, the

transfer device having a fluid portal through which fluid can flow from the fluid delivery device to the drug vial and a vent channel that is in fluid communication with a vent that is formed as part of the transfer device to permit air to flow into the drug vial.

25. The automated system of claim 24, wherein the first section is formed by removing a wedge shaped section of the distal end of main fluid conduit to form a sharp, pointed end.

26. The automated system of claim 24, wherein the transfer device has an activation valve associated with the fluid portal for selectively preventing fluid from flowing within the fluid portal in either direction except when the valve has been activated.

27. The automated system of claim 26, wherein the second luer fitting comprises a female luer and the first luer fitting comprises a male luer and the valve is activated by the presence of the male luer fitting within the female luer fitting.

28. The automated system of claim 24, wherein medication is removed from the drug vial through the fluid portal while the drug vial is in an inverted position and as the medication is removed, air is drawn through a vent filter and through the vent channel into the drug vial to displace the removed medication.

29. A method for automated preparation of a medication including automated syringe preparation that includes reconstitution of the medication and delivery of the reconstituted medication to a syringe from a drug vial, the method comprising the steps of:

providing a fluid delivery device for delivering a prescribed dosage amount of medication to the syringe by injecting the medication through an uncapped barrel in a just-in-time for use manner, wherein the fluid delivery device includes a fluid conduit having a first luer fitting formed at a distal end thereof;

providing a transfer device that includes a first section for piercing the septum of the drug vial and a second section that includes a second luer fitting that complementarily mates with the first luer fitting to produce a sealed luer fitting, the transfer device having a fluid portal through which fluid can flow from the fluid delivery device to the drug vial and a vent channel that is in fluid communication with a vent that is formed as part of the transfer device to permit air to flow into the drug vial.

piercing the septum of the drug vial with the first section such that the fluid portal and the air channel are in fluid communication with an interior of the drug vial;

mating the second luer fitting with the first luer fitting to produce the sealed luer fitting therebetween;

reconstituting the medication in the drug vial by first discharging a prescribed amount of diluent through the fluid delivery device and the fluid portal into

the drug vial; then agitating the medication in the drug vial, then aspirating and later discharging the prescribed dosage amount of medication from the drug vial into the syringe in a just-in-time for use manner;

venting air through the vent channel as air is delivered into the drug vial;
and

leaving the transfer device within the drug vial for multiple fluid transfers without the need to pierce the septum more than one time.

30. The method of claim 29, wherein the fluid delivery device is in selective fluid communication with a fluid pump apparatus that is in selective fluid communication with a diluent source, the fluid pump apparatus having a first controllable syringe that is in fluid communication with the diluent source and with a second controllable syringe that is also in selective fluid communication with the fluid delivery device through a primed main conduit, each of the syringes being operably connected to a drive that causes either a positive or negative pressure to exist in a barrel thereof, and the step of reconstituting the medication includes the steps of:

opening fluid communication between the diluent source and the first syringe and preventing fluid communication between the second syringe and the fluid delivery device;

operating a drive of one of the first and second syringes to create a negative pressure therein resulting in a prescribed amount of diluent being drawn into the barrel thereof;

preventing fluid communication between the diluent source and the first syringe and allowing fluid communication between the second syringe and the fluid delivery device;

operating the drive so as to discharge the prescribed amount of diluent from one of the first and second syringes into the primed main conduit resulting in the prescribed amount of diluent being discharged through the fluid delivery device and into the drug vial;

agitating contents of the vial;

operating a drive of one of the first and second syringes to create a negative pressure therein resulting in the prescribed dosage amount of medication being aspirated into the main conduit with an air block separating the aspirated medication from the diluent in the main conduit due to a volume of diluent, which is equal to the prescribed dosage amount, be drawn into the syringe barrel;

mating the fluid delivery device with the transfer device; and

operating the drive of one of the first and second syringes to create a positive pressure therein resulting in the prescribed dosage amount of medication being discharged from the main conduit into the syringe as a result of the volume of diluent being discharged from the syringe into the main conduit.

31. The method of claim 29, wherein the first luer fitting is a male slip luer fitting and the second luer fitting is a female slip luer fitting and the step of mating the second luer fitting with the first luer fitting comprises the step of:

inserting the male slip luer fitting into the female luer slip fitting so as to form the sealed luer slip fitting between the fluid delivery device and the transfer device.

32. The method of claim 29, wherein the first luer fitting is a female luer lock fitting and the second luer fitting is a male luer lock fitting and the step of mating the second luer fitting with the first luer fitting comprises the step of:

interlockingly mating the male luer lock fitting into the female luer lock fitting so as to form the sealed luer lock fitting between the fluid delivery device and the transfer device.